

Wind Turbine Inverter

WINDY BOY 1100 / 1200 / 1700

Installation Guide



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1 Notes on this Guide

This guide describes how to assemble, install, commission and service the Windy Boy 1100 (WB 1100), Windy Boy 1200 (WB 1200) and the Windy Boy 1700 (WB 1700).

Store this guide where it can be accessed at all times.

1.1 Scope of Validity

This guide applies to the following device types with firmware version 2.64 and higher:

- WB 1100 (discontinued model)
- WB 1200
- WB 1700

1.2 Target Group

This guide is for qualified electrical technicians. The tasks described in this guide may be performed by qualified personnel only.

1.3 Additional Information

You will find further information on special topics such as designing a line circuit breaker or the description of the operating parameters in the download area at www.SMA.de/en.

Refer to the user manual for detailed information on troubleshooting and operating the Windy Boy.

1.4 Symbols Used

The following types of safety precautions and general information are used in this guide:



DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE!

NOTICE indicates a situation that can result in property damage, if not avoided.



Information

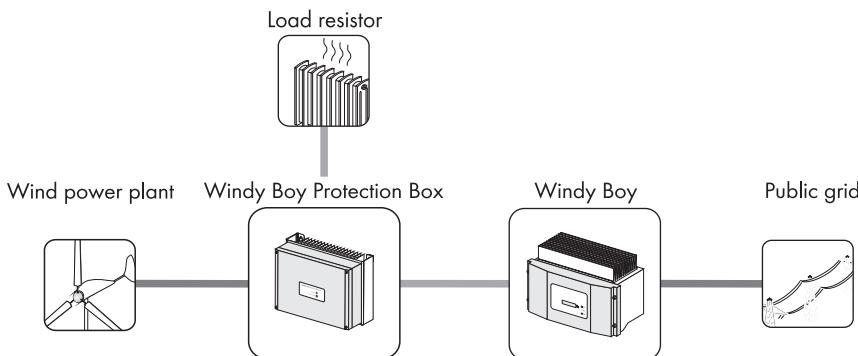
Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety

2.1 Appropriate Usage

The Windy Boy is a wind power inverter, which converts rectified current of a wind turbine system into AC current and feeds this energy into the public grid, domestic grid or the Sunny Island system.

Principle of a Wind Turbine System using a Windy Boy



Furthermore, the Windy Boy can be used as inverter for power conversion units based on the permanent magnet generators (hydro power systems, combined heat and power plants, diesel generator, etc.). The manufacturer of the wind turbine system or the generators should have his system set up for operation with the Windy Boy (see also the Windy Boy planning guidelines in the download area at www.SMA.de/en).

When designing the PV system, ensure that the permitted operating range of all components are maintained at all times. Moreover, make sure that through appropriate protective measures the maximum admissible input voltage is not exceeded. SMA Solar Technology offers you the corresponding components, such as the Windy Boy Protection Box (overvoltage protection for wind power inverters including the rectifier).

2.2 Safety Instructions

**DANGER!**

**Electric shock due to high voltages in the inverter when connecting the device.
Death or serious injuries.**

- All work on the inverter may be carried out by qualified personnel only.
- Work on the inverter should only be carried out as described in this guide.
- All listed safety instructions must be followed.

**CAUTION!**

Risk of burns through contact with the hot enclosure during operation. Burns to the palm of the hand.

- Do not touch the enclosure during operation.

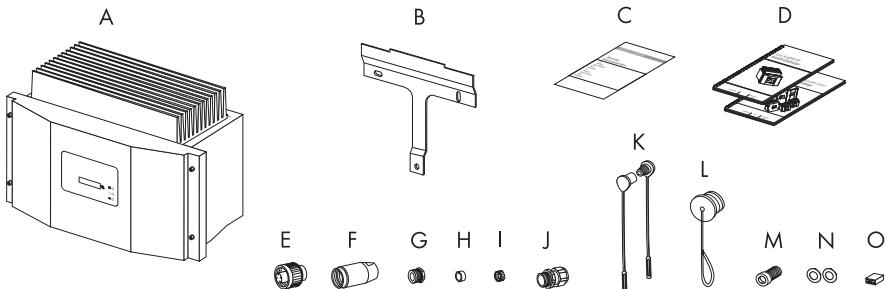
**Problems while performing the described activities**

If you have problems while performing any of the activities described in this guide, contact SMA Solar Technology (see section 13 "Contact" (page 47)).

3 Unpacking

3.1 Packing List

Check the delivery for completeness and for any visible external damage such as cracks in the enclosure or the display. Contact your dealer if anything is damaged or missing.



| Object | Quantity | Description |
|--------|----------|--|
| A | 1 | Inverter |
| B | 1 | Wall mounting bracket |
| C | 1 | Document set |
| D | 2 | Manual (1 x installation guide, 1 x user manual) |
| E | 1 | Socket element |
| F | 1 | Threaded sleeve |
| G | 1 | Pressure screw PG13.5 |
| H | 1 | Sealing ring PG13.5 |
| I | 1 | Fastening case PG13.5 |
| J | 1 | Cable gland PG16 |
| K | 2 | Protective cap for DC plug connector |
| L | 1 | Protective cap for AC socket |
| M | 1 | M6x12 cylinder head screw |
| N | 2 | Polyamide disk M5 (replacement for lid) |
| O | 1 | Jumper |

3.2 Identifying the Product

You can identify the inverter by the type plate. The type plate is on the right side of the enclosure. On the type plate you will find the type (Type / Model) and the serial number (Serial No.) of the inverter.

4 Mounting the Device

4.1 Selecting the Mounting Location

**DANGER!**

Risk of explosion or fire during the installation of the inverter in non-permissible areas. Death or serious burns.

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount inverters in areas with a risk of explosion.

**CAUTION!**

Risk of burns through contact with the hot enclosure during operation. Burns to the body.

- Mount the inverter in such a way that unintentional contact with the enclosure is not possible.

**CAUTION!**

Risk of injury from falling inverter during transport. Physical injury (fractures or crushing) and damage to the inverter.

- Take the weight of the inverter of approx. 25 kg into account.



Overheating of the inverter due to close proximity to other inverters in areas with high ambient temperatures.

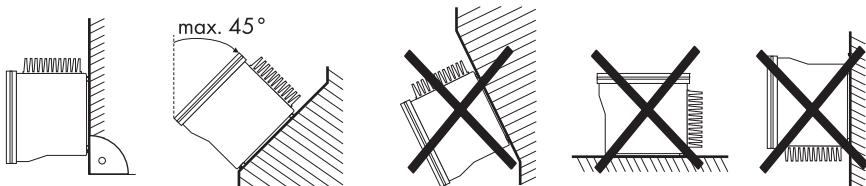
If several inverters have been installed in areas with high ambient temperatures, the independent cooling of individual inverters needs to be guaranteed.

If needed, increase the distance between the individual inverters and provide enough fresh air to ensure the optimal operation of the inverters.

Observe the Following Conditions During Mounting:

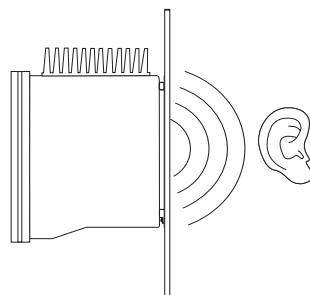
- The installation method and mounting location must be suitable for the inverter's weight and dimensions.
- Mount on a solid surface.
- The installation location must be accessible at all times.
- The ambient temperature should be between -20 °C and +60 °C to guarantee optimal operation.
- Do not expose the inverter to direct sunlight to avoid a power reduction due to excessive heating.
- Install at eye level in order to allow the operating status to be read at all times.
- Vertical installation or tilted backwards by max. 45°.

- Never mount the device with a forward tilt.
- Do not mount in a horizontal position.
- The connection area may not point upwards.

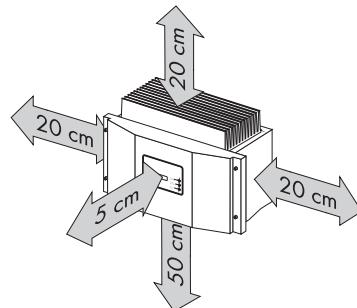


- In a living area, do not mount the inverter on plasterboard walls etc. in order to avoid audible vibrations.

The inverter can make noises when in use which may be perceived as a nuisance in a living area.



- Observe the minimum clearances to walls, other inverters or objects as shown in the diagram in order to guarantee sufficient heat dissipation.



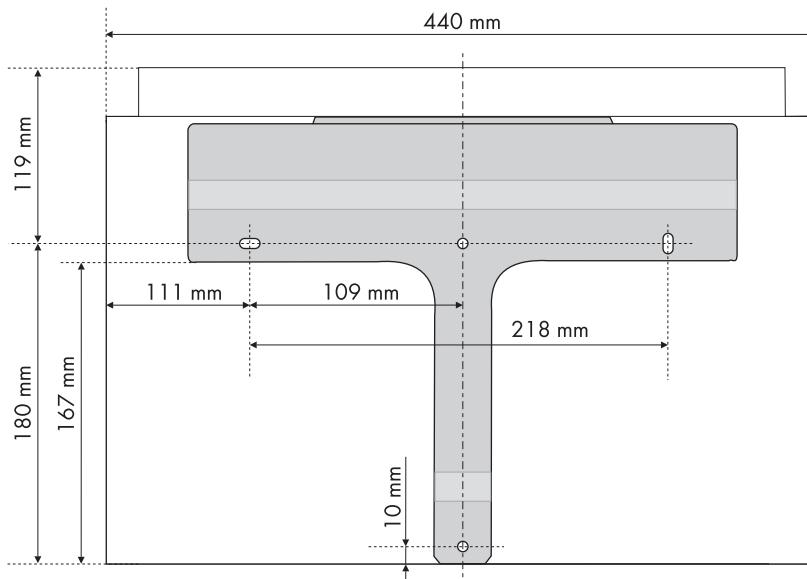
4.2 Mounting the Product with a Wall Mounting Bracket

**CAUTION!**

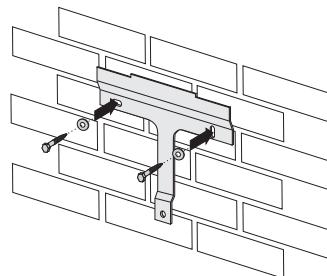
Risk of injury from falling inverter during transport. Physical injury (fractures or crushing) and damage to the inverter.

- Take the weight of the inverter of approx. 25 kg into account.
- When mounting the bracket, use fastening material suitable for the material.

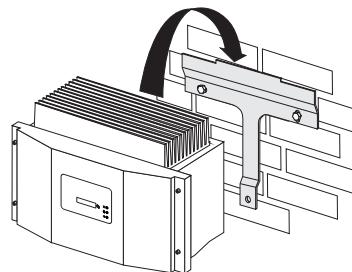
1. Use the wall mounting bracket as a drilling template and mark the position of the drill holes.



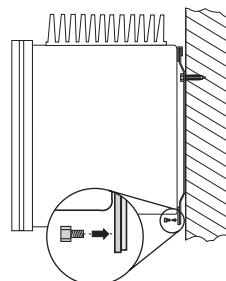
2. Attach the wall mounting bracket to the wall using appropriate screws and washers.



3. Fit the product in the wall mounting bracket using the upper mounting clips in such a way as to prevent the product from being pushed out of the wall mounting bracket from the side.



4. Use the provided M6x12 screws to fix the product and prevent it from being lifted out of place.



5. Make sure that the device is securely in place.

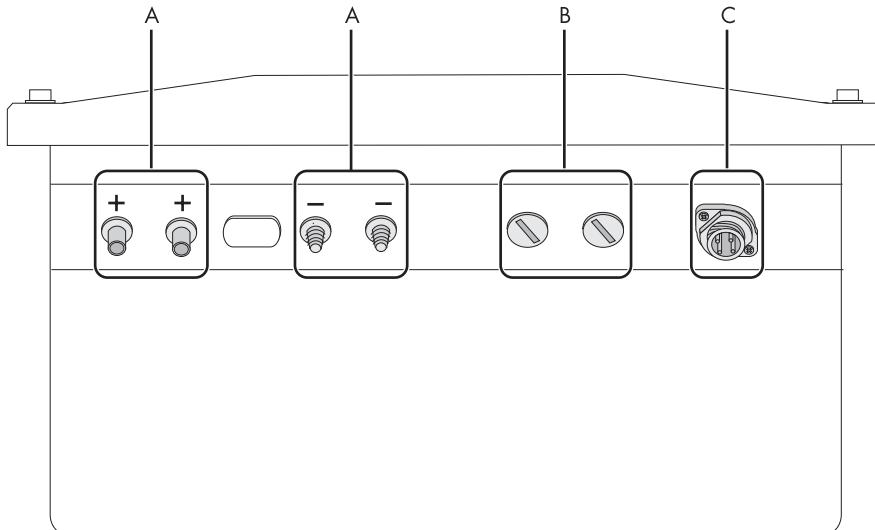
- The product is now mounted to the wall.

5 Electrical Connection

5.1 Overview of the Connection Area

5.1.1 Exterior View

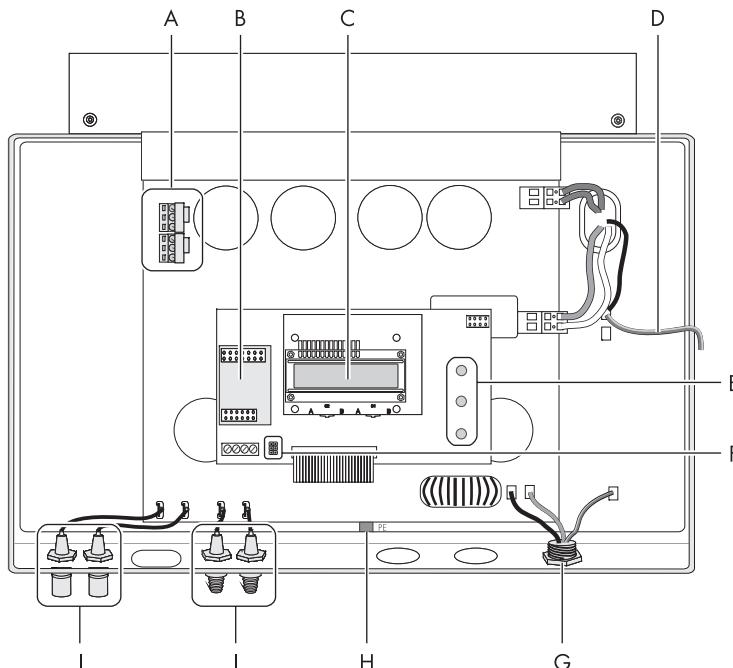
The following figure shows the assignment of the individual enclosure openings on the base of the inverter.



| Object | Description |
|--------|--|
| A | Plug connector for connecting the wind turbine system (DC) |
| B | Cable feed-through for communication (with sealing plugs) |
| C | AC socket for grid connection |

5.1.2 Interior View

The following illustration shows the various components and connection areas of the open inverter.



| Object | Description |
|--------|---|
| A | Varistors |
| B | Slot and connection area for communication |
| C | Display |
| D | PE connection for the enclosure lid |
| E | Operating status LEDs |
| F | Jumper slot for communication |
| G | AC socket for grid connection |
| H | Tab for grounding the cable shield with RS485 communication |
| I | Plug connector for connecting the wind turbine system (DC) |

5.2 Connecting the Public Grid (AC)



Connection requirements of the utility operator

Always observe the connection requirements of the utility operator.

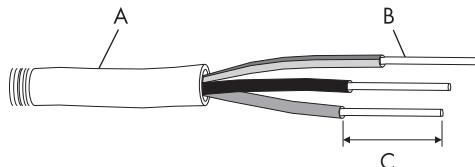
Dimensioning the Cables

The wire cross-sectional area should be dimensioned so output losses do not exceed 1 % at nominal power.

The maximum wire lengths relative to the conductor cross-section are shown in the following table.

| Wire cross-sectional area | Maximum wire length | | |
|---------------------------|---------------------|---------|---------|
| | WB 1100 | WB 1200 | WB 1700 |
| 1.5 mm ² | 21 m | 18 m | 15 m |
| 2.5 mm ² | 35 m | 30 m | 22.5 m |

Cable Requirements



| Object | Description | Value |
|--------|---------------------------|-----------------------------|
| A | External diameter | 9 ... 17 mm |
| B | Wire cross-sectional area | maximum 2.5 mm ² |
| C | Strip insulation | 4 ... 5 mm |

The conductor cross-sectional area required in individual cases depends on the following factors:

- Ambient temperature
- Routing method
- UV resistance
- Cable losses
- valid installation guidelines of the respective country (of the installation site)

Load Disconnection Unit

You must install a separate line circuit breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible rating is located in 11 "Technical Data" (page 42).

Detailed information and examples for the design of a line circuit breaker can be found in the Technical Information "Line Circuit Breaker" in the download area at www.SMA.de/en.



DANGER!

Risk of burns due to parallel connection of more than one inverter to a single line circuit breaker. Death or serious burns.

When more than one inverter are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. It can result in a cable fire or the destruction of the inverter.

- Never connect several inverters to a single line circuit breaker.
- Comply with the maximum permissible fuse protection of the inverter when selecting the circuit breaker.



NOTICE!

Damage to the inverter by using screw type fuse elements as load disconnection unit!

A screw type fuse element, e.g. D system (Diazed) or D0 system (Neozed) is not a load disconnection device, and thus may not be used as a load disconnection unit. A screw type fuse element is only used as cable protection.

When disconnecting under load using a screw type fuse element, the inverter can be damaged.

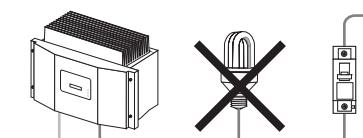
- Use only a load disconnecting switch or a line circuit breaker as load disconnecting unit.



DANGER!

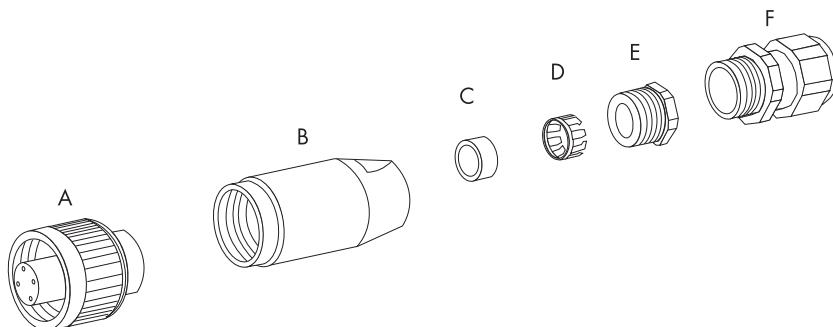
Electric shock due to missing protective function on the line circuit breaker. Death or serious burns.

When a generator (Windy Boy) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the Windy Boy and the grid can add up to overcurrent which is not detected by the line circuit breaker.



- Never connect loads between the inverter and the line circuit breaker without protection.
- Always protect loads separately.

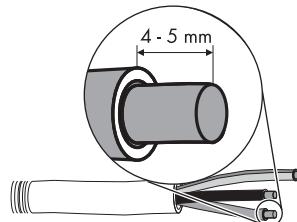
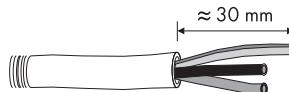
Overview of the AC connection socket



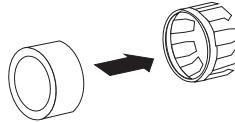
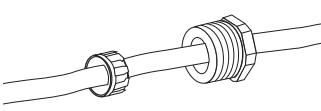
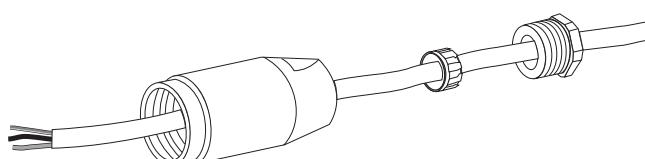
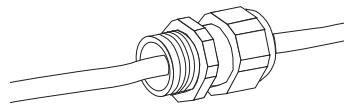
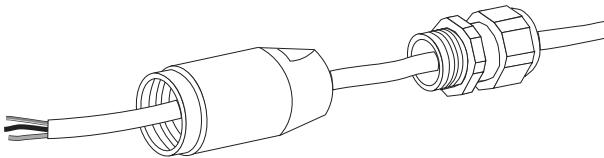
| Object | Description |
|--------|---|
| A | Socket element |
| B | Threaded sleeve |
| C | Sealing ring PG13.5 |
| D | Fastening case PG13.5 |
| E | Pressure screw PG13.5 (for cable diameters between 9 and 13.5 mm) |
| F | Cable gland PG16 (for cable diameters between 13.5 and 17 mm) |

Connection Procedure

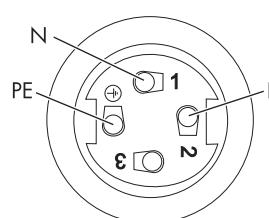
1. Check if grid voltage is within the admissible voltage range.
2. Strip approx. 30 mm from the AC cable.
3. Shorten phase L and neutral conductor N approx. 5 mm
4. Strip 4 to 5 mm of insulation from the AC cable.



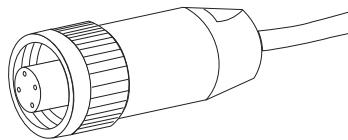
5. Lead the pressure screw PG13.5 or cable gland PG16 and threaded sleeve via the AC cable.

| Size used | Procedure |
|-----------|--|
| PG13.5 | <ul style="list-style-type: none"> Push the sealing ring into the fastening case.  <ul style="list-style-type: none"> Lead the pressure screw PG13.5 and the fastening case including the sealing ring over the AC cable.  <ul style="list-style-type: none"> Lead threaded sleeve over the AC cable.  |
| PG16 | <ul style="list-style-type: none"> Lead the cable gland PG16 over the AC cable.  <ul style="list-style-type: none"> Lead threaded sleeve over the AC cable.  |

- Insert the protective earth PE (green-yellow) into the screw terminal with the earth sign on the socket element and tighten the screw.
- Insert the neutral conductor N (blue) into the screw terminal 1 on the socket and tighten the screw.
- Insert phase L (brown or black) into the screw terminal 2 on the socket and tighten the screw.
- Leave screw terminal 3 unused.
- Make sure the wires are securely connected.



- Screw the threaded sleeve onto the socket element.

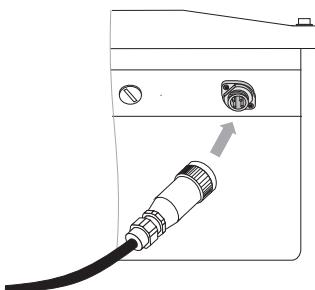


- Tighten the pressure screw PG 13.5 or cable gland PG16 tightly onto the threaded sleeve.

| Size used | Result |
|---------------|---|
| PG13.5 | The fastening case along with the sealing ring is pressed into the threaded sleeve and can no longer be seen. |
| PG16 | |

The AC connection socket has been screwed together.

- Close the socket element with the provided protective cap, if it is not immediately connected to the inverter.
- Insert the AC connection socket into the AC socket on the inverter. If necessary, remove the protective cap beforehand.
- Turn the threaded ring of the AC connection socket tightly onto the AC socket on the inverter. The threaded ring serves to seal and relieve strain on the AC connection socket.



The AC cable is now connected to the inverter.

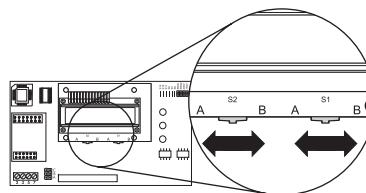
5.3 Setting the Display Language

You can set the display language using the switches underneath the display assembly inside the inverter.

Proceed as follows:

1. Open the inverter as described in section 7.1 "Opening the Product" (page 28).
2. Set the switches for the required language, as shown below.

| Language | Switch S2 | Switch S1 |
|----------|-----------|-----------|
| German | B | B |
| English | B | A |
| French | A | B |
| Spanish | A | A |



The display language is set.

3. Close the inverter as described in section 7.2 "Closing the Product" (page 28).

5.4 Communication

The inverter is equipped with a slot for communication interfaces, so that it can communicate using special data acquisition devices (e.g. Sunny WebBox) or a PC with appropriate software.

See the communication interface manual for a detailed wiring diagram and a description of the mounting.

5.5 Connecting the Wind Turbine System (DC)

The connecting cables of the wind turbine system must be equipped with plug connectors so that the DC input sockets of the inverter can be connected.

SMA Solar Technology offers a pre-assembled accessory set for connecting loose cable heads. For more information about this set, see section 12 "Accessories and Replacement Parts" (page 46).

Connection Procedure



NOTICE!

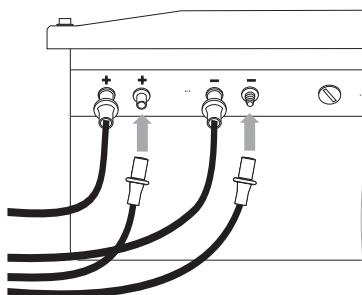
Risk of overvoltage by exceeding the limiting values on the DC input. Destruction of the inverter.

- Do not exceed the maximum input voltage of 400 V (DC).
- Install overvoltage protection (e.g. Windy Boy Protection Box) between the wind turbine system and the inverter.

1. Check the connection cables of the wind turbine system for correct polarity.
2. Check the connection cables and DC plug connectors for the ampacity of the maximum input current.

| Inverter | Maximum input current |
|----------|-----------------------|
| WB 1100 | 10 A (DC) |
| WB 1200 | 12.6 A (DC) |
| WB 1700 | 12.6 A (DC) |

3. Connect the DC connector to the inverter.



4. Close unused DC input sockets with the protective caps provided.
- The wind turbine system is connected.

5.6 Setting the grid parameters



Changing Grid-Relevant Parameters

To change grid-relevant parameters on the inverter you need a personal access authorization, the SMA Grid Guard password. Contact the SMA Serviceline to receive your individual SMA Grid Guard password.

5.6.1 Setting the installation country

Using the "Default" parameter you can set the installation country and/or the grid connection standard valid for the country via a communication device (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Data Control). This, however, is only required if the inverter was originally ordered for another country. You can see the standard to which the inverter was set upon delivery on the type plate.

5.6.2 Setting Off-Grid Operation

To operate the inverter in a Sunny Island system, you must set the inverter via the "Default" parameter to off-grid ("OFF-Grid") operation.

You have several possibilities to set the inverter to off-grid operation:

- Setting via Sunny Boy Control, Sunny WebBox
- Setting via Sunny Data Control



DANGER!

**Danger to life due to high voltages in the event of outage of the public grid.
Death or serious burns.**

If you set the inverter to off-grid operation, it does not fulfill any country-specific standards and regulations. Therefore if there is an outage of the public grid there exists the danger of back feed.

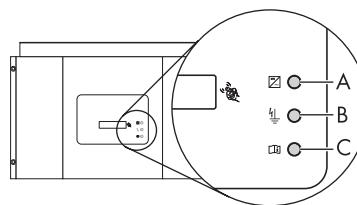
- Never operate the inverter directly on the public grid when set to off-grid operation.

6 Commissioning the Product

1. Check the following requirements before commissioning:
 - Correct mounting and correct connection of the inverter.
 - Correct layout of the line circuit breaker.
 - Correct grounding of the wind turbine system according to the manufacturer's instructions.
 - Rectifier and overvoltage protection (e.g. Windy Boy Protection Box) between the wind turbine system and the inverter have been installed.
2. Commission the wind turbine system according to the manufacturer's instructions.

The green LED glows or blinks: commissioning has been successful.
or
 The red or yellow LED glows or blinks: an disturbance has occurred.

| Object | Description |
|--------|---|
| A | Green LED: Operation |
| B | Red LED: Ground fault or varistor defective |
| C | Yellow LED: Disturbance |



3. Read section 9.1 "Error Messages" (page 30) and if necessary, eliminate the disturbance.

6.1 Overview of the Blink Codes



Explanation of the Blink Codes

A detailed description of the blink codes can be found in the user manual included in delivery.

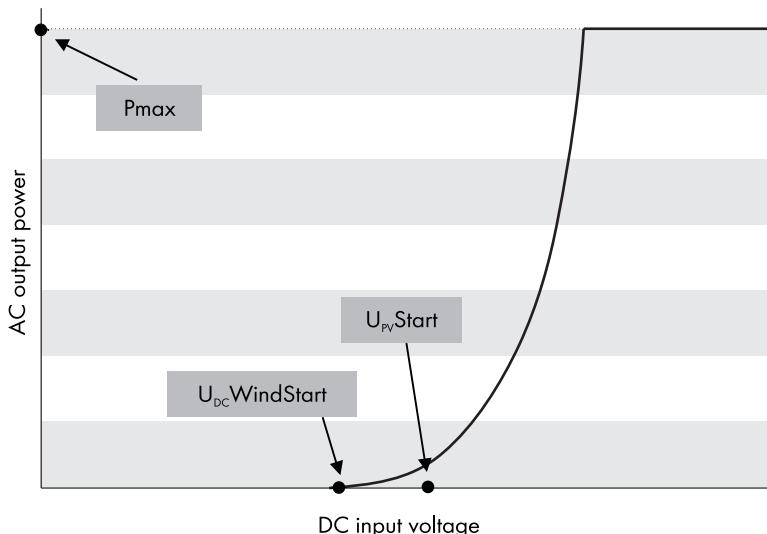
| Green | Red | Yellow | Status |
|--|-------------------|-------------------|--|
| Glow continuously | Is not glowing | Is not glowing | OK (feeding operation) |
| | Glow continuously | Is not glowing | Disturbance |
| | | Glow continuously | OK (initialization) |
| Blinks quickly (3 x per second) | Is not glowing | Is not glowing | OK (stop) |
| | Glow continuously | Is not glowing | Disturbance |
| Flashes slowly (1 x per second) | Is not glowing | Is not glowing | OK (waiting, grid monitoring) |
| | Glow continuously | Is not glowing | Disturbance |
| briefly goes out (approx. 1 x per second) | Is not glowing | Is not glowing | OK (derating) |
| | Glow continuously | Is not glowing | Disturbance |
| Is not glowing | Is not glowing | Is not glowing | OK (DC voltage too low) |
| | | grows/blinks | Disturbance |
| | Glow continuously | Is not glowing | Error (ground fault or varistor defective) |
| | | grows/blinks | Error and Disturbance |

6.2 Settings in Turbine Mode

The "Turbine Mode" of the inverter contains a programmable output characteristic curve (performance and voltage curve) in order to optimize the energy yield of the wind turbine system. The inverter regulates its output power according to the generator voltage.

6.2.1 Polynomial characteristic curve

The following illustration shows the function of a typical polynomial output characteristic curve of a Windy Boy 1100 / 1200 / 1700. Here, the fed-in AC power is shown according to the DC input voltage of the inverter.



In order to guarantee optimum inverter operation in conjunction with the wind turbine system, you can adjust the following parameters:

- U_{PV}Start
- U_{DC}WindStart
- Wind_a₀ ... Wind_a₃
- Pmax
- P-Wind-Ramp
- KP-Wind-Reg
- KI-Wind-Reg
- T-Stop

You will find descriptions of the named operating parameters in the download area at www.SMA.de/en. You can set the parameter settings using your PC with the Windy Boy Setup Tool (www.SMA.de/en).

6.2.2 Turbine Mode

Startup Procedure

If the inverter has enough voltage and power, the startup process is displayed by means of simultaneous lighting of the three LEDs on the inverter.

As soon as the DC input voltage defined in the parameter "U_{PV}Start" is reached, the inverter starts a number of self-tests and measurement processes and synchronizes with the grid. This operating mode is indicated by means of the green LED blinking on the inverter.

When the tests are successfully completed and the DC input voltage is above "U_{PV}Start", for the time configured in "T-Start," the inverter connects to the grid and the green LED lights up. The inverter then switches to characteristic curve operation, and regulates the input current according to the generator voltage.

Characteristic Curve Operation

After the startup process, the inverter switches to characteristic curve operation, and regulates the output current according to the generator voltage.

The inverter then begins to put a load on the wind turbine system and then according to the present input voltage, takes power from the wind turbine system and feeds it into the grid. The maximum power corresponds to the maximum AC power of the inverter. However, this can be set using the parameter "Pmax".

Shutdown Procedure

If the wind strength is so low that the DC input voltage falls below an internally calculated value, the inverter ceases feeding power into the mains grid for the period defined in "T-Stop". When the DC input voltage increases again, the inverter switches back to characteristic curve operation.

If the DC input voltage for the time set in "T-Stop" falls below the internally calculated value, the inverter will switch off.

If the DC input voltage is no longer sufficient to supply the on-board electronics with power, the inverter deactivates immediately.

7 Opening and Closing

7.1 Opening the Product

**DANGER!**

Electric shock due to high voltage in the inverter. Death and serious burns.

- Brake the wind turbine system and secure it to prevent it from being restarted.
- Disconnect the inverter on the AC and DC sides.
- Wait 15 minutes for the capacitors to discharge.

**NOTICE!**

Touching the components inside the inverter can result in electric discharge. Irreparable Damage.

- Ground yourself before touching a component.

1. Check whether all LEDs and the display have gone out.
 2. Remove the screws on the enclosure lid and put them to one side.
 3. Pull the enclosure lid slightly forward.
 4. Disconnect the PE connection from the enclosure lid. Loosen the locking on the PE connection on the enclosure lid.
 5. Remove the enclosure lid and set it aside.
- The product is open.

7.2 Closing the Product

1. Create a PE connection to the enclosure lid.
 2. Mount the lid onto the enclosure.
 3. Tighten the four fixing screws equally.
 4. Commission the product as described in section 6 "Commissioning the Product" (page 24).
- The product is closed and operational.

8 Maintenance and Cleaning

Check the correct operation of the product at regular intervals. Contaminants such as dust can limit the product's ability to dissipate heat. Also check the product and the cables for visible external damage. Undertake repairs if necessary.

9 Troubleshooting

When the inverter signals other blink codes or display messages, as described in section 6 "Commissioning the Product" (page 24), read the user manual provided to determine exactly what the display or blink code indicates. In the user manual, you will also find a description of the status messages, measuring channels and messages.

Please do not try to carry out repairs other than those described here. Use the SMA Solar Technology 24-hour replacement service (the inverter will be sent within 24 hours) and repair service instead.

9.1 Error Messages

When an error occurs, the inverter generates a message, which depends on the operating mode and the type of the detected error.

| Message | Description / Assistance |
|-------------------------------------|---|
| !PV-Overvoltage! !Disconnect DC! | <p>DC overvoltage!</p> <p>Immediately disconnect the wind turbine system from the inverter:</p> <ol style="list-style-type: none"> 1. Turn off the line circuit breaker. 2. Stop the wind turbine system. 3. Disconnect the DC plug connectors. 4. Check the DC voltage: <ul style="list-style-type: none"> – If the DC voltage is above the maximum input voltage, check the system design. – If the DC voltage is under the maximum input voltage, reconnect the wind turbine system to the inverter as described in section 5.5 "Connecting the Wind Turbine System (DC)" (page 22). |
| ACVtgRPro | <p>The 10-minute-average grid voltage is no longer within the permissible range. This can be caused by grid voltage or impedance that is too high at the connection point of the inverter.</p> <p>Check the grid voltage at the point of connection to the inverter:</p> <ul style="list-style-type: none"> • If the grid voltage is 253 V or higher, due to your local grid conditions, contact your utility operator and ask whether the voltage at the grid connection point can be adjusted. <p>or</p> <ul style="list-style-type: none"> • Ask your utility operator if they can change the threshold value of the parameter ACVtgRPro for the monitoring of the voltage quality. <p>If the grid voltage is continually within the acceptable range, and this error is still displayed, contact the SMA Serviceline.</p> |

| Message | Description / Assistance |
|--------------------------------|--|
| Bfr-Srr | <p>Internal measurement comparison disturbance or hardware defect.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| CAN | <p>Internal communication disturbance.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| DCBFS-Startup | <p>Internal error in communication.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| DCBFS Version | <p>DC-BFS has the incorrect firmware version.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| Delta Bfr-Srr | <p>Internal measurement comparison disturbance or hardware defect. At least one string fuse is defective.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| Derating | <p>The "Derating" operating mode is a normal operating mode which may occur occasionally and can have several causes. Specific information about this can be found in the user manual included in delivery.</p> |
| dFac-Bfr dFac-Srr | <p>The changes in grid frequency exceed the permissible range. The suffixes "Bfr" und "Srr" are not relevant.</p> <ul style="list-style-type: none"> • If possible, check the grid frequency and observe how often major deviations occur. If deviations continue to increase in frequency and result in the display of these error messages, ask the utility operator whether they will allow the operation parameters "dFac-Max" to be changed. • Coordinate the changing of the operation parameters with the SMA Solar Technology Serviceline as well. |
| Fault Curr Meas dl-Mess-srr | <p>Deviation in the differential current measurement / differential current If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled.</p> <ul style="list-style-type: none"> • You can attempt to remove the fault with the aid of a communication interface and the corresponding communication product (e.g. PC with appropriate software). Should this be unsuccessful, contact the SMA Serviceline to discuss further action to solve the problem. |
| dl-Test | <p>Defect in the differential current measurement.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |

| Message | Description / Assistance |
|-------------------------------|--|
| dZac-Bfr dZac-Srr | <p>The changes in grid impedance exceed the permissible range. The suffixes "Bfr" und "Srr" are not relevant.</p> <ul style="list-style-type: none"> • If possible, check the grid impedance and observe how often major deviations occur. If deviations continue to increase in frequency and result in the display of these error messages, ask the utility operator whether they will allow the operation parameters "dZac-Max" to be changed. • Coordinate the changing of the operation parameters with the SMA Solar Technology Serviceline as well. |
| EEPROM | <p>Transition disturbance during reading or writing of EEPROM data. The disturbance has no effect on the performance of the inverter.</p> |
| EEPROM dBh | <p>EEPROM Data is defective, the inverter has switched itself off because the loss of data has disabled important functions of the inverter.</p> <ul style="list-style-type: none"> • Contact the SMA Solar Technology Serviceline. |
| EeRestore | <p>One of the duplicate data sets in the EEPROM is defective and has been reconstructed without loss of data. The error message only serves to inform you and has no effect on the performance of the inverter.</p> |
| Fac-Bfr Fac-Srr FacFast | <p>The grid frequency has left the allowable range. The suffixes "Bfr" und "Srr" are not relevant.</p> <ul style="list-style-type: none"> • Check the grid frequency and grid connection on the inverter. If the grid frequency is outside the permissible range due to local conditions, ask the utility operator whether he agrees to change the operating parameters. If the grid frequency lies within the tolerable range, yet "Fac-Bfr," "Fac-Srr" "FacFast" faults are still being displayed, contact the SMA Serviceline. |
| HW-Signal | <p>Internal measurement disturbance or hardware defect.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| Iac-DC_Offs-Srr | <p>The DC component of the electricity being fed into the grid has left the permissible range.</p> <ul style="list-style-type: none"> • If the grid current is outside the permissible range due to local grid conditions, contact the local utility operator for assistance. • If the grid current lies within the tolerable range, yet the "Iac-DC_Offs-Srr" fault is still being displayed, contact the SMA Serviceline. |
| IGBTs | <p>Disturbance in the inverter's power electronics.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |

| Message | Description / Assistance |
|---------------|--|
| Imax | Overcurrent on the AC side. This indicator is displayed when the current at the AC grid is greater than specified. <ul style="list-style-type: none">Check the system design and the grid conditions! |
| Imax DC | Overcurrent on the DC side of the inverter. <ul style="list-style-type: none">Check the system design! |
| K1-Close | During the relay test a disturbance occurred. |
| K1-Open | <ul style="list-style-type: none">If this error message occurs frequently, contact the SMA Serviceline. |
| K2-Open | |
| Kom DC-BFS | Internal communication disturbance. <ul style="list-style-type: none">If this error message occurs frequently, contact the SMA Serviceline. |
| L<>N | L and N are swapped on the AC connection. <ul style="list-style-type: none">Check the AC connection! |
| L-Netz | A grid relay is faulty. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons. |
| L-WR | |
| N-Netz | |
| N-WR | If this disturbance occurs repeatedly, the inverter displays a permanent restriction of operation. <ul style="list-style-type: none">You can attempt to remove the fault with the aid of a communication interface and the corresponding communication product (e.g. PC with appropriate software). Should this be unsuccessful, contact the SMA Serviceline to discuss further action to solve the problem. |
| MWE Defekt DC | Internal measurement comparison disturbance or hardware defect. |
| MSD-Fac | <ul style="list-style-type: none">If this error message occurs frequently, contact the SMA Serviceline. |
| MSD-Fac | |
| MSD-Vac | |
| MSD-Timeout | |
| MSD-Zac | |
| Offset | Fault in the acquisition of measurement data. <ul style="list-style-type: none">If this error message occurs frequently, contact the SMA Serviceline. |
| MSD-Timeout | Functional fault in one of the two microcontrollers. <ul style="list-style-type: none">If this error message occurs frequently, contact the SMA Serviceline. |

| Message | Description / Assistance |
|----------------|---|
| Relais 1 | A grid relay is faulty. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons. |
| Relais 2 | |
| Relais 3 | |
| Relais 4 | If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. |
| | <ul style="list-style-type: none"> • You can attempt to correct the fault with the aid of a communication interface and the corresponding communication product (e.g. PC with the appropriate software). Should this be unsuccessful, contact the SMA Solar Technology Serviceline to discuss further action to solve the problem. |
| REL_INV_CLOSE | A grid relay does not close. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons. |
| REL_GRID_CLOSE | |
| | If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. |
| | <ul style="list-style-type: none"> • You can attempt to correct the fault with the aid of a communication interface and the corresponding communication product (e.g. PC with the appropriate software). Should this be unsuccessful, contact the SMA Solar Technology Serviceline to discuss further action to solve the problem. |
| REL_INV_OPEN | A grid relay does not open. The inverter checks the relays connecting it with the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons. |
| REL_GRID_OPEN | If this disturbance occurs repeatedly, the inverter displays a permanent restriction of operation. |
| Riso / | The electrical insulation between the wind turbine system to ground is faulty. |
| Ground fault | <ul style="list-style-type: none"> • The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range. |
| Riso-Sense | The insulation measurement has failed. |
| ROM | The inverter's firmware is faulty. |
| SD-DI-Wandler | The inverter has detected an insulation fault on the DC side. |
| | <ul style="list-style-type: none"> • Open the inverter as described in section 9.2.1 "Checking the Wind Turbine System for Ground Fault" (page 37). |

| Message | Description / Assistance |
|---------------|---|
| SD-Imax | <p>The inverter has detected an overcurrent on the AC side. It disconnects from the grid for safety reasons and then attempts to reconnect to the grid.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| SD-WR-Bruecke | <p>The inverter has detected a fault in the power electronics. It disconnects from the grid and then attempts to reconnect to the grid.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| Shutdown | Temporary inverter fault. |
| STM Timeout | <p>Internal disturbance during program operation.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| Trafo-Temp-F | <p>Temperatures in the transformer have exceeded the acceptable limit. The inverter stops feeding the grid until the temperature reverts to within the admissible range.</p> <ul style="list-style-type: none"> • If this error occurs frequently, check the heat dissipation. |
| Trafo-Temp-W | <p>If the transformer reaches an unacceptably high temperature, the inverter stops feeding into the grid until the transformer has reached an admissible temperature and the system can begin feeding into the grid again. The "Trafo-Temp-W" warning is displayed until the device is completely switched off.</p> <ul style="list-style-type: none"> • Check the heat dissipation of the inverter. |
| Vac-Bfr | The grid voltage has left the allowable range. The suffixes "Bfr" und "Srr" are not relevant. |
| Vac-Srr | For reasons of safety, the inverter disconnects itself from the grid. |
| UDiff | Disturbance in the intermediate circuit. |

| Message | Description / Assistance |
|--------------------------|---|
| VpvMax | DC overvoltage! |
| Vpv-Max | <p>Immediately disconnect the wind turbine system from the inverter:</p> <ol style="list-style-type: none"> 1. Turn off the line circuit breaker. 2. Stop the wind turbine system. 3. Disconnect the DC plug connectors. 4. Check the DC voltage: <ul style="list-style-type: none"> - If the DC voltage is above the maximum input voltage, check the system design. - If the DC-voltage is under the maximum input voltage, reconnect the wind turbine system to the inverter as described in section 5.5 "Connecting the Wind Turbine System (DC)" (page 22) |
| Uzkposneg<10 | Disturbance in the intermediate circuit. |
| UZWK-Max | The internal hardware monitor has detected an overvoltage condition in the intermediate circuit of the inverter. |
| Watchdog Watchdog-Srr | <p>Internal disturbance during program operation.</p> <ul style="list-style-type: none"> • If this error message occurs frequently, contact the SMA Serviceline. |
| Zac-Bfr Zac-Srr | <p>The grid impedance has left the allowable range. The suffixes "Bfr" und "Srr" are not relevant.</p> <p>For reasons of safety, the inverter disconnects itself from the grid. The impedance is calculated from both the grid impedance and the impedance of the AC cable of the inverter.</p> <ul style="list-style-type: none"> • Check the grid impedance and the AC connection on the inverter. Use a cable with an adequate cross-sectional area (= low impedance), observing the advice on this matter in section 5.2 "Connecting the Public Grid (AC)" (page 16). • This fault may also be rectified by tightening the screws of the AC terminals. • Should the problem continue to occur, contact the SMA Serviceline to discuss further action to solve the problem. |

9.2 Red LED is continuously lit

Should the red LED on the inverter illuminate continuously during operation, either there has been a ground fault in the system or at least one of the varistors inside the inverter is defective.

In intentionally grounded wind turbine systems, the red LED has been illuminated since the commissioning of the inverter. However, this has no effect on the functioning of the inverter. Before you check the wind turbine system for a ground fault, make sure an intentional connection to the ground has been carried out.

With intentionally grounded wind turbine systems, check occasionally that the varistors inside the inverter function, since a fault with the varistors can no longer be displayed.

9.2.1 Checking the Wind Turbine System for Ground Fault



DANGER!

Electric shock resulting from contact with current-carrying parts. Death or serious burns.

- Do not touch the wind turbine system.
- Only touch the insulated part of the cabling for the wind turbine system.
- Do not touch PE.

1. Disconnect the inverter from the grid on the AC side.
2. Remove the DC connector from the inverter.
3. Measure the voltages between the positive pole of the DC cables and the ground potential.
4. Measure the voltages between the negative pole of the DC cables and the ground potential.

| Result | Action |
|---|---|
| <input checked="" type="checkbox"/> A voltage is measurable for one of the two measurements. | There is a ground fault in the system. <ul style="list-style-type: none"> • Correct the ground fault and reconnect the wind turbine system to the inverter as described in section 5.5 "Connecting the Wind Turbine System (DC)" (page 22) |
| <input checked="" type="checkbox"/> No voltage can be measured. | It is likely that one of the thermally monitored varistors is defective. <ul style="list-style-type: none"> • Check the function of the varistors as described in section 9.2.2 "Checking the Function of the Varistors" (page 38). |

- The check for ground faults in the system is completed.

9.2.2 Checking the Function of the Varistors

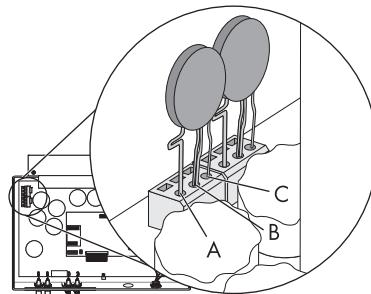
Varistors are wearing parts. Their functioning becomes restricted through aging or due to repeated responses as a result of overvoltages. It is therefore possible that one of the thermally monitored varistors has lost its protective function.



Position of Varistors

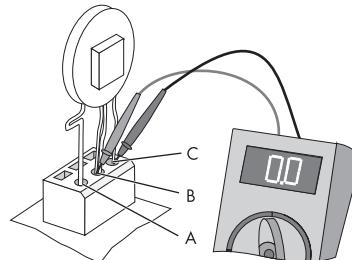
The position of the varistors is to be determined with the help of the diagram below. Observe the following allocation of the terminals:

- Terminal A: outer terminal
(varistor connection **with crimp**)
- Terminal B: middle terminal
- Terminal C: outer terminal
(varistor connection **without crimp**)



You can check the functionality of the varistors in the following manner:

1. Open the inverter as described in section 7.1 "Opening the Product" (page 28).
2. Use a multimeter to check all the varistors in the installed state to ascertain whether there is a conducting connection between connectors B and C.



| Result | Action |
|--|--|
| <input checked="" type="checkbox"/> There is a conducting connection. | There is probably a different fault in the inverter. <ol style="list-style-type: none"> 1. Close the inverter as described in section 7.2 "Closing the Product" (page 28). 2. Contact the SMA Serviceline. |

| Result | Action |
|---|--|
| <input checked="" type="checkbox"/> There is no conducting connection. | <p>The respective varistor is defective and must be replaced.</p> <p>Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology recommends that you replace both varistors.</p> <p>The varistors are specially manufactured for use in the inverter and are not commercially available. You can purchase the varistors directly from SMA Solar Technology (see section 12 "Accessories and Replacement Parts" (page 46)).</p> <ul style="list-style-type: none"> • To replace the varistors, proceed to step 3. |



NOTICE!

Overvoltage on the inverter due to defective or faulty varistors. Destruction of the inverter.

- Replacement varistors should be obtained as soon as possible.
- For systems with a high risk of overvoltage, do **not** operate inverters using faulty varistors or no varistors at all.

3. Insert insertion tool into the opening of the terminal contacts (1).

- The terminal clamps loosen.

If you do not receive an insertion tool for operating the terminal clamps with your replacement varistors, contact SMA Solar Technology. The terminal contacts can also be provisionally serviced by a screwdriver with a 3.5 mm blade width.

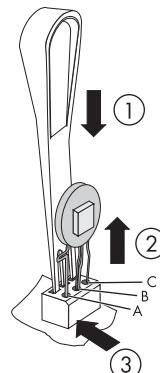
4. Remove the varistor (2).

5. Insert new varistor.

The pole with the small loop (crimp) must be fitted to terminal A (3) when remounting.

6. Close the inverter as described in section 7.2 "Closing the Product" (page 28).

- The check and replacement of the varistors is completed.



10 Decommissioning

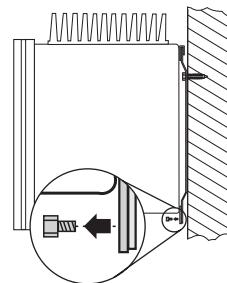
10.1 Disassembling the Product

**CAUTION!**

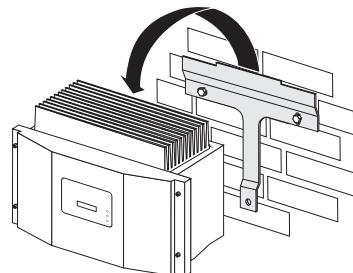
Risk of injury from falling inverter during transport. Physical injury (fractures or crushing) and damage to the inverter.

- Take the weight of the inverter of approx. 25 kg into account.

1. Open the enclosure lid as described in section 7.1 "Opening the Product" (page 28).
2. Remove all cables from the product.
3. Secure the lid to the enclosure.
4. Remove the screw between the product and the wall mounting bracket.



5. Remove the product from the wall mounting bracket.



- Product has been removed.

10.2 Packaging the Product

If possible, always package the product in the original packaging. If it is no longer available, you can also use an equivalent carton. The box must be completely closeable and made to support both the weight and the size of the product.

10.3 Storing the Product

Store the product in a dry place where ambient temperatures are always between -20 °C and +60 °C.

10.4 Disposing of the Product

Dispose of the product at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (see section 13 "Contact" (page 47)).

11 Technical Data

| DC input | | WB 1100 | WB 1200 | WB 1700 |
|---|----------------|---------------------------------|-------------|-------------|
| Turbine control | | Polynomial characteristic curve | | |
| DC nominal power | $P_{DC, nom}$ | 1100 W | 1200 W | 1700 W |
| Max. DC power | $P_{DC, max}$ | 1210 W | 1320 W | 1850 W |
| Recommended generator power at 2500 full-load hours / year | $P_{DC, 2500}$ | 1000 W | 1050 W | 1400 W |
| Recommended generator power at 5000 full-load hours / year | $P_{DC, 5000}$ | 900 W | 1000 W | 1300 W |
| Min DC output power for feeding operation | $P_{DC, min}$ | 12 W | 14 W | 14 W |
| Nominal DC operating voltage | $U_{DC, nom}$ | 180 V | 120 V | 180 V |
| Max. DC voltage | $U_{DC, max}$ | 400 V | | |
| Min. DC voltage at $U_{AC} = 230$ V | $U_{DC, min}$ | 139 V | 100 V | 139 V |
| DC voltage range Turbine Mode at $U_{AC} = 230$ V | | 139 - 400 V | 100 - 400 V | 139 - 400 V |
| Min. open-circuit voltage for grid synchronization (configurable) | $U_{PVStart}$ | 150 V | 110 V | 150 V |
| DC voltage ripple | UPP | < 10 % | | |
| Nominal input current | $I_{DC, nom}$ | 6.1 A | 9.4 A | 9.4 A |
| Max. input current (total) | $I_{DC, max}$ | 10 A | 12.6 A | 12.6 A |
| Number of input ports (terminals) | | 2 | | |
| Max. current per input | | 10 A | 12.6 A | 12.6 A |

| AC output | | WB 1100 | WB 1200 | WB 1700 |
|---|---------------|----------------|---------------------|----------------|
| Nominal AC output | $P_{AC, nom}$ | 1000 W | 1200 W | 1550 W |
| Max. AC power | $P_{AC, max}$ | 1100 W | 1200 W | 1700 W |
| Nominal AC current | $I_{AC, nom}$ | 4.4 A | 5.2 A | 6.7 A |
| Max. output current | $I_{AC max}$ | 5.6 A | 6.1 A | 8.6 A |
| Max. permissible fuse protection | | | 16 A | |
| Harmonic distortion of the grid current at $K_{Ugrid} < 2\%$ and $P_{AC} > 0.5 P_{nom}$ | K_{IAC} | | < 4 % | |
| Nominal AC voltage | $U_{AC, nom}$ | | 230 V | |
| Grid voltage range | | | 220 V - 240 V | |
| Min. grid voltage | $U_{AC, min}$ | | 180 V | |
| Max. grid voltage | $U_{AC, max}$ | | 260 V | |
| AC nominal frequency (self-adjusting) | f_{AC} | | 50 Hz / 60 Hz | |
| Operating range, grid frequency | | | -4.5 Hz / +4.5 Hz | |
| Power factor at $P_{AC,nom}$ | cos phi | | 1 | |
| Overvoltage category | | | III | |
| AC Connection | | | AC plug connector | |
| Max. cable diameter | | | 17 mm | |
| Max. connection cross-sectional area (wire) | | | 2.5 mm ² | |

| Protective Equipment | |
|--|---|
| AC short-circuit protection | Current control |
| Islanding detection | Yes |
| Galvanically isolated | Yes / LF transformer |
| All-pole disconnection unit on the AC side | Independent disconnection device: SMA Grid Guard 2 |
| DC reverse polarity protection | Short-circuit diode |
| All-pole disconnection unit on the DC side | Plug connector |
| DC overvoltage protection (Windy Boy Protection Box) | optional |

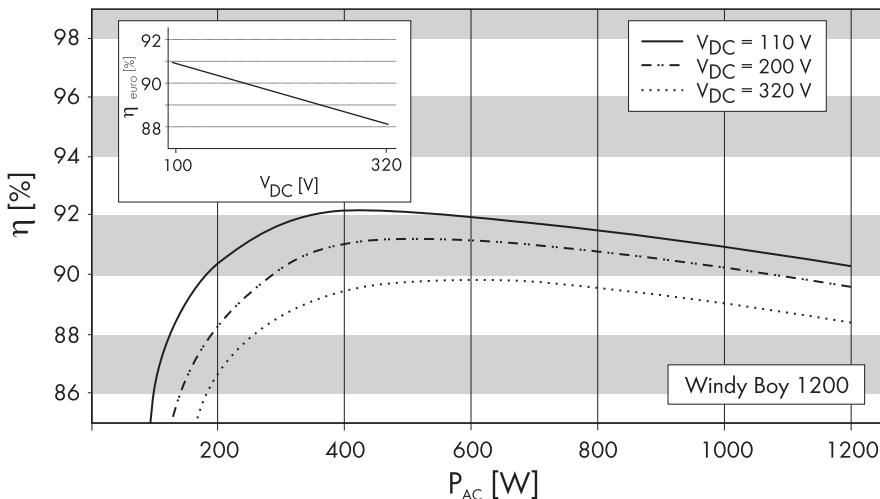
| General data | WB 1100 | WB 1200 | WB 1700 |
|--|---------|---|---------|
| Dimensions (W x H x D in mm) | | 440 x 299 x 214 | |
| Weight | 23.3 kg | 24.5 kg | 24.5 kg |
| Protection rating according to DIN EN 60529 | | IP65 | |
| EC Declaration of Conformity | | Enclosed, download area www.SMA.de/en | |
| Operation temperature range | | -20 °C - +60 °C | |
| Relative air humidity (admissible) | | 0 - 100 % | |
| Max. operating altitude above mean sea level | | 2000 m | |
| Cooling concept | | Convection | |
| Internal consumption in operation | | < 4 W | |
| Internal consumption in standby | | 0.1 W | |
| Topology | | Low frequency transformer | |

Efficiency

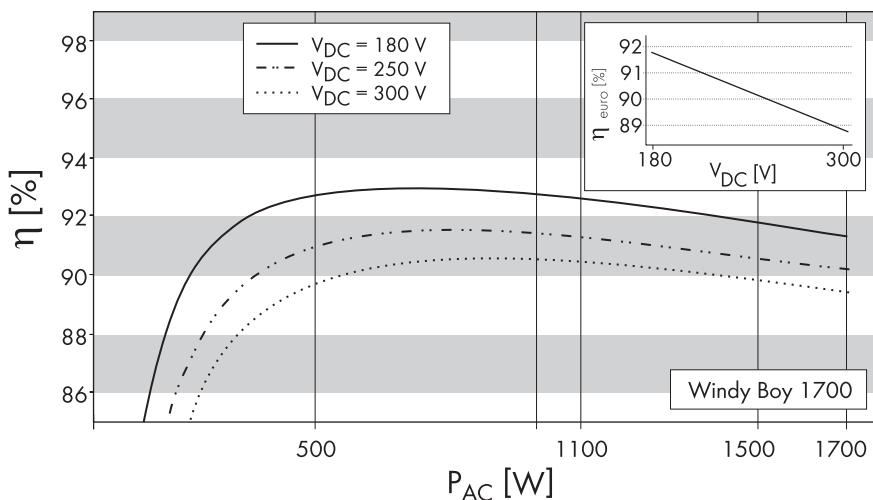
| | | | | |
|-----------------|----------------------|--------|--------|--------|
| Max. efficiency | $\eta_{\text{max.}}$ | 93 % | 92.1 % | 93.5 % |
| Euro ETA | η_{euro} | 91.6 % | 90.9 % | 91.8 % |

Efficiency curves

WB 1200



WB 1700



12 Accessories and Replacement Parts

You will find the corresponding accessories and replacement parts for your product in the following overview. If needed, you can order these from SMA Solar Technology or your dealer.

| Name | Brief description | SMA order number |
|--|--|------------------|
| Set for DC connection Multi-Contact (3 mm) | Pre-configured set for connecting loose cable ends. Max. flow current: 21 A. | SWR-MC |
| Set for DC connection Multi-Contact (4 mm) | Pre-configured set for connecting loose cable ends. Max. flow current: 30 A. | MC-SET |
| Set for Tyco DC connection | Pre-configured set for connecting loose cable ends. Max. flow current: 30 A. | TYCO-SET |
| Windy Boy Protection Box: | Rectifiers and overvoltage protection for wind turbine systems with Windy Boy | WBP Box 400 |
| Replacement varistors | Set of thermally monitored varistors (2) including insertion tool | SB-TV3 |
| Insertion tool for varistors | Tool for installing the varistors | SB-TVWZ |
| RS485 upgrade set | RS485 interface | 485PB-NR |
| Radio upgrade kit | Radio Piggy-Back for upgrading an inverter for communication with Sunny Beam, including antenna, coaxial cable, and PG cable gland (metal) | BEAMPB-NR |
| Bluetooth® Wireless Technology upgrade kit | Bluetooth interface | On request |

13 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Inverter serial number
- Type of connected wind turbine system
- Communication type
- Blink code or display of the inverter

SMA Solar Technology AG

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SMA Serviceline

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- Damages during transportation
- Improper or inappropriate use of the product
- Operating the product in an unintended environment
- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond statutory limit values
- In case of unforeseen calamity or force majeure

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